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First Report of Papaya Mealybug *Paracoccus marginatus* (Hemiptera:Pseudococcidae) from Malaysia.

[1]M.I. Mastoi, [1]A. Nur Azura, [1]R. Muhammad, [2]A.B. Idris and [3]Y. Ibrahim.

[1]Dept. of Plant Protection, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia,
[2]School of Environmental and Natural Resource Sciences, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 Bangi, Selangor, Malaysia
[3]Department of Agricultural Science, Faculty of Technical and Vocational Education, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia.

Abstract: *Paracoccus marginatus*, Williams and Granara de Willink 1992 (Hemiptera: Pseudococcidae) commonly known as papaya mealybug (PMb) is reported for the first time in Malaysia on papaya, cassava, eggplant, Jatropha and hibiscus plants. Four species of chalcidoid parasitoids were observed parasitizing the PMb. *Acerophagus papayae* was the major parasitoid of PMb. Two common predators namely *Apertochrysa* sp. and *Cryptolaemus montouzieri* were also found feeding on PMb.

Key words: Papaya mealybug, *Paracoccus marginatus, Acerophagus papayae*, Malaysia.

INTRODUCTION

The papaya mealybug *Paracoccus marginatus* Williams and Granara de Willink 1992 (Hemiptera: Sternorrhyncha: Pseudococcidae), is a notorious pest of papaya. It is a polyphagous insect pest and has been recorded from more than 60 host plants of 22 families (Ben-Dov 2008). Besides papaya, other important hosts recorded are citrus, mango, avocado, tomato, eggplant, pepper, beans, peas, sweet potato, cotton, hibiscus, cherry, pomegranate, rubber etc. (Miller and Miller 2002; Heu *et al*., 2007).

In 1955, papaya mealybug specimens were collected for the first time from cassava plant *Manihot esculenta* from Mexico. Then the pest was collected many times from different localities of neotropical region (Belize, Costa Rica, Guatemala, etc). Williams and Granara de Willink described the speciesin 1992 and then re-described by Miller and Miller in 2002 (Williams and Granara de Willink 1992; Miller and Miller 2002).

As the pest is native to Mexico, it never caused serious problems there due to availability of its endemic natural enemies (Miller *et al*., 1999). The first invasion of pest recorded in the Carribean (St. Martin) in 1995 and then accidently spread to 13 countries in the Carribean, the US and South America (Meyerdirk *et. al*, 2004). In 2002, the pest was recorded from Guam infesting papaya plants severely and then in 2003 it was reported from Palau. In 2004 the pest invaded Hawaii causing serious losses to papaya plantations (Heu *et al*. 2007). The pest was managed successfully through introductions ofthree encyrtidparasitoids where ever it invaded. The successful results were achieved in Guam, Palau, Florida and Hawaii. (Walker *et. al*, 2003, Meyerdirk *et. al*, 2004, Muniappan *et. al*, 2006).

Recently the pest was recorded from oriental region when a team of Integrated Pest Management Collaborative Research Support Programme (IPM CRSP) Virginia Tech visited Botanical Gardens in Bogor, Indonesia and Tamil Nadu Agri. University, Coimbatore, India on May 29, 2008 and July 10, 2008 respectively. They found that papaya mealybug has caused serious damage to papaya and showed their concern about the presence of the pest in neighbouring countries of oriental region and also alerted the South East Asian scientists community to be vigilant about spreading of pest to other localities (Muniappan et. el 2008). Due to this reason, a survey was conducted in three states in west coast of Peninsular Malaysia namely Negeri Sembilan, Perak and Selangor.

Corresponding Author: Nur Azura Adam, Dept. of Plant Protection Faculty of Agriculture Universiti Putra Malaysia 43400 UPM Serdang Selangor, Malaysia Off: +60389467232 Fax: +60386560698
E-mail: nur_azura@putra.upm.edu.my

Methodology:

A survey was conducted in three states of Peninsular Malaysia namely Negeri Sembilan, Perak and Selangor. Four visits in Negeri Sembilan (Nilai and Port Dickson), one in Perak (Bidor) and frequent visits in Selangor (Serdang) were organized from January 2009 to December 2010 to investigate the possibility of invasion of *P. marginatus* in Malaysia.

A total number of seven papaya farms were visited with each farms having more than 100 plants. Besides papaya farms, a number of wild and home garden plants of papaya, rambutan, starfruit, jackfruit, cassava, eggplant, jatropha and hibiscus including some ornamental trees and shrubs were also monitored for possibility of any infestation of PMb.

Few severely infested leaves of papaya and cassava plants were also brought to the laboratory of Department of Plant Protection, Faculty of Agriculture UPM to examine the natural enemies of the PMb. Mummies were separated with the help of fine camel brush and kept in glass vials covered with muslin cloth for any emergence of parasitoids.

RESULTS AND DISCUSSION

The pest was frequently recorded from Negeri Sembilan (Nilai and Port Dickson) and Selangor (Seri Kembangan). The first severely infested papaya plant (Fig 1) was recorded on 10th February 2009 at Experimental Farm-10, Faculty of Agriculture, University Putra Malaysia (UPM) along with another 11 plants in the same row was minorly infested (only leaves were infested along with midrib and veins). There were an other 47 plants about 60-80 meter away were totally free from *P. marginatus* infestation at that time. After eight months (14 Oct 2009), the pest was recorded from all 47 papaya plants including 8 plantswhich could not survive and were cut down. From 6 Nov 2009 to 15 June 2010, more than 200 wild and home managed papaya plants were observed on different dates in Seri Kembangan (Selangor). Out of these 37 plants recorded as infested with *P. marginatus.* The pest is also recorded from cassava, eggplant, jatropha and hibiscus (Fig 2) in vicinity of Seri Kembangan (Selangor). The infestation of papaya mealybug typically observed as clusters of cotton-like masses on underside of leaves near veins and midribs and on upper side of leaf and fruits if plant is severely infested.

Two common predators namely *Apertochrysa* sp. and *Cryptolaemus montouzieri* were found to feed voraciously on egg masses and nymphs of papaya mealybug. Four species of chalcidoid parasitoids emerged from the mummies of PMb. One of them is identified as *Acerophagus papayae*. (Noyes and Schauff, 2003) and was observed to be the most abundance. Remaining three parasitoids found in smaller quantity most probably the hyperparasitoids.

The parasitoid *Acerophagus papayae* is also native to Mexico and imported to Palau and Guam for classical biological control of papaya mealybug (Meyerdirk *et. al,* 2004, Muniappan *et. al,* 2006). The introductions of *Acerophagus papayae* Noyes and Schauff, *Anagyrus loekii* Noyes and *Pseudleptomastix mexicana* Noyes and Schauff parasitoids were found successful where ever the pest invaded (Meyerdirk *et. al,* 2004 and Muniappan *et. al,* 2006). Among these three parasitoids, *Acerophagus papayae* was found to bean efficient parasitoid and have ability to establish itself when introduced to new localities (Amaraskare *et. al,* 2009).

Now it is confirmed that the *P. marginatus* has also invaded Malaysia. Tropical and humid environment always favored this pest to its introduction and establishment (Miller *et al*., 1999) that will likely result a serious economic threat to the Malaysian horticultural crops especially fruits and ornamental. Temperature range in Malaysia also favours this pest for its successful establishment and rapid multiplication. Amarsekare *et al*., (2008) studied life history of papaya mealybug at different constant temperatures and found 25-30 ºC is the ideal range of temperatures for rapid multiplication of the pest. Fortunately the pest invaded along with its potential parasitoid, *Acerophagus papayae*in Malaysia, which remained an efficient parasitoid of papaya mealybug in Guam, Palau and Florida (Meyerdirk *et. al,* 2004, Muniappan *et. al,* 2006, Amaraskare *et. al,* 2009).

Conclusion:

Keeping in view the economic importance and rapidly spreading of PMb from neotropical to oriental region, the sustainable pest management tactics should be initiated at the earliest stage as the infestation level is still low. Therefore biological studies of PMb and its natural enemies in Malaysia is important to understand the forecasting and successful management of the pest.

a.

b.

c.

Fig. 1: *Paracoccus marginatus* infestation on: a) papaya; b) cassava; c) hibiscus.

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